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(54) **Method and apparatus for screening waste paper pulp**

Verfahren und Vorrichtung zur Reinigung von Altpapierfaserbrei

Procédé et dispositif pour l'épuration d'une pulpe de vieux papiers

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Description

The present invention relates to a method and an apparatus for separating contaminants from waste paper pulp stock and defibering undefibered waste paper for use by industries which use waste paper pulp as stock, such as the paper pulp and fiberboard industries. More specifically, the invention relates to apparatus for screening waste paper pulp stock of the type comprising a cylindrical casing having a stock inlet at one end, a reject outlet at the other end and one or more accept stock outlets between its ends, a cylindrical screen plate concentrically arranged within the casing and spaced from its peripheral wall, an annular defibering stator concentrically arranged adjacent the end of the screen plate closest to the reject outlet, a rotor arranged within the casing for rotation about its axis within the screen plate, the casing defining an inlet chamber, which communicates with the stock inlet and with the space inside the screen plate, an accept stock chamber between the screen plate and the wall of the casing, which communicates with the accept stock outlet(s), and a reject chamber, which communicates with the reject outlet, the rotor carrying scraper blades opposed to the screen plate to prevent clogging thereof and a defibering rotor opposed to the defibering stator and defining therewith a defibering gap which communicates with the reject chamber and with the space within the screen plate and means for supplying dilution water to the space downstream of the defibering gap.

Screening apparatus is generally composed of coarse and fine screening stages.

In the coarse screening stage, relatively large contaminants are removed, using a screen plate with holes usable for relatively high consistency (2 to 4%) stock slurry, that is to say stock slurry containing 2 to 4% by weight solid material, in order to reduce the quantity of contaminants which is transferred to the fine screening stage.

In the fine screening stage, fine contaminants not removable by the above-mentioned hole screen plate are removed, using a screen plate with slots suitable for relatively low consistency (0.5 to 2%) stock slurry so as to facilitate the passage of the stock through the screen.

In general, the screening efficiency or removal ratio of contaminants by a screen is closely related to the reject ratio. An increase or decrease of reject ratio lead to an enhancement or reduction of the contaminant removal ratio, respectively. Attempts to reduce the reject ratio in an ordinary screen will tend to cause plugging or clogging of the screen plate or plugging of the reject valve due to the increased consistency of the reject. Even if such plugging can be prevented, substantial reduction of the reject ratio would worsen the removal ratio, as shown in Figure 1, so that a good screening effect is not obtained. A certain increase in the reject ratio is therefore required in order to obtain pulp with an acceptably reduced quantity of contaminants. However, an increase of the reject ratio results in a reduction of the yield.

In general, in order to overcome this problem in a screening stage, a reject ratio of 20 to 25% is selected, above which value the curve shown in Figure 1 becomes relatively flat and the contaminant removal ratio is less affected by changes in the reject ratio, and the reject is re-processed by a so-called "multiple cascade flow" system to reduce the reject ratio of the system as a whole. In a typical multiple cascade flow system, the reject from a primary screen is processed by a secondary screen and the accept stock from the second screen is mixed with that of the primary screen. The reject of the secondary screen is processed by a tertiary screen and the accept stock is returned to the feed stock of the secondary screen. Only the reject of the tertiary screen is discharged out of the system. Generally, the stock slurry consistency in a screen is higher than the consistency of the feed stock and therefore the feed stock used for the cascade must be diluted with water to an appropriate consistency for the screen.

Paper stock to be fed to a screening stage is in the form of defibered suspension of waste paper in water produced by a defibrator, usually called a pulper. The defibering performance of a pulper is not in a linear relationship to the defibering time period (power input). In comparison with the initial defibering performance, the subsequent defibering performance is reduced, that is to say defibering efficiency reduces with time. Thus, defibering efficiency is satisfactory up to a certain level or degree of defibering [i.e., defibered stock/ (defibered stock + undefibered stock)] and a higher power input is required for defibering above this level. In order to defiber stock which has been defibered to the certain level, a device generally called "secondary defibrator" is widely used. Typical secondary defibrators are closed pulper type defibrators and high-speed defibrators. Such secondary defibrators also have defibering performance which is not in a linear relationship to the power input and are effective for use at a zone or portion of the system where undefibered waste paper is accumulated.

The defibering of undefibered waste paper is very significant for the improvement of the production yield since undefibered waste paper exhibits the same behaviour as contaminants which are to be removed in screening stages.

Figure 2 is a flow diagram of a known method and apparatus for screening waste paper stock pulp slurry. The apparatus includes a tank for receiving waste paper stock slurry which has been defibered by a pulper (not shown), a coarse screening stage A and a fine screening stage B. The coarse screening stage A includes primary, secondary and tertiary coarse screening screens b, c and d, using apertured screen plates, respectively, a high-speed defibrator g for defibering the reject of the primary coarse screening; and tanks e, f and m. The fine screening stage B includes primary, secondary, tertiary and quaternary fine screens h, i, k and l, using slotted screens, a high-speed defibrator j for defibering the reject of the secondary fine screening and tanks n, o and p. In Figure 2, solid lines represent pulp

lines and dotted lines represent lines for the reject including undefibered waste paper.

In the method of Figure 2, conventional screens with hole or aperture screen plates are used in the coarse screening stage A. The reject of the primary screen b is processed by the high-speed defibrator g to defiber undefibered waste paper accumulated in the reject. In the fine screening stage B, a quaternary cascade system with slot screens is used and the reject of the secondary screen is processed by the high-speed defibrator j.

In Figure 2, nine separate screening units, seven tanks with agitators and seven pumps are required. For automatic operation, various instruments are further required, such as pressure controllers for each screen and level controllers for each tank.

Instead of defibering waste paper, the waste paper may be ground by a refiner. Such grinding is, however, directed to crushing not only the undefibered waste paper but also contaminants, such as plastics, and is different from defibering in which contaminants, such as plastics and pieces of wood, pass through without being crushed, and therefore has an inferior degree of screening compared with defibering. Also, the stock slurry consistency in the grinding method is as high as 15 to 25% while in the defibering method, the stock must be diluted to have a consistency of 1 to 4% because of the above difference.

As described above, the greater the number of screens for the cascade, the greater is the degree of screening and the production yield also the greater are the scale and cost of the facilities.

To solve the above problems, there have been various proposals to provide a system in which a screening section is combined with a defibering section or with a grinding section.

For example, JP-A-62-90391 proposes "a screening apparatus with reject reducing means" which processes pulps containing vegetable fiber of 6 to 15% consistency. A grinding zone is provided adjacent to a screen with a cylindrical screen plate and the quantity of the reject is decreased by grinding the reject of the screen into pulp. However, when this apparatus is used for waste paper pulp, following problems arise:-

(1) Unlike vegetable fiber pulp. waste paper pulp includes not only undefibered waste paper but also contaminants such as plastics and metal pieces. If these contaminants are ground and mixed into the accept, the product quality is decreased.

(2) A consistency suitable for grinding is 15 to 25%. in the case of waste paper pulp, if the reject of the screen is condensed to this consistency range, plugging tends to occur in the screen. If the meshes of the screen are enlarged to prevent such plugging, then the contaminant removal ratio is reduced.

(3) Contaminants remain in the pulp after the grinding. To remove them, another screen is required.

The inventors have made various experiments and have found that, when waste paper pulp slurry is screened, the reject not passing through the screen accumulates progressively and its consistency increases as the slurry flows through the screening section, thereby reducing the separation effect, and that the separation effect may be improved if such condensed reject is diluted in the screen.

Against this background, it is the object of the present invention to provide a method and an apparatus for screening waste paper pulp stock which is simple, economical and space saving and results in an increased contaminant removal ratio and production yield.

FR-A-2377475, on which the precharacterising portion of Claims 1, 4, 7 and 9 are based, discloses a method and apparatus for screening waste paper pulp stock in which the pulp stock is exposed to a screen plate and the reject is passed through a defibering gap and is then diluted with water and the diluted reject is then subjected to a further screen plate.

According to one aspect of the present invention the apparatus for screening waste paper pulp stock of the type referred to above is characterised in that the rotor defines a dilution water chamber which communicates with the reject chamber and with the space within the screen plate, at least at the portion closest to the reject outlet, through a plurality of openings formed in the peripheral wall of the dilution chamber and spaced apart in the peripheral direction and the dilution water supply means terminates in or adjacent the dilution chamber for supplying dilution water to the dilution chamber.

It is preferred that the screen plate is constituted by two substantially coaxial screen plates which partially define respective portions of the accept stock chamber which are separated from one another by a partition and communicate with respective accept stock outlets.

In one embodiment of the invention the gap defined by the defibering stator and the defibering rotor communicates directly with the reject chamber, the surfaces defining the said gap are divergent in the direction towards the reject chamber and the dilution water supply means is arranged to supply dilution water into the reject chamber at a position adjacent to the dilution chamber.

According to a further aspect of the present invention there is provided an apparatus for screening waste paper pulp stock of the type comprising a cylindrical casing having a stock inlet at one end, a reject outlet at the other end and one or more accept stock outlets between its ends, a first cylindrical screen plate concentrically arranged within

the casing and spaced from its peripheral wall, an annular defibering stator concentrically arranged adjacent the end of the first screen plate closest to the reject outlet, a rotor arranged within the casing for rotation about its axis within the first screen plate, the casing defining an inlet chamber, which communicates with the stock inlet and with the space inside the first screen plate, an accept stock chamber between the first screen plate and the wall of the casing, which communicates with the accept stock outlet(s), and a reject chamber, which communicates with the reject outlet, the rotor carrying scraper blades opposed to the first screen plate to prevent clogging thereof and a defibering rotor opposed to the defibering stator and defining therewith a defibering gap which communicates on its upstream side with the space within the first screen plate, means for supplying dilution water to the space downstream of the defibering gap, a second cylindrical screen plate concentrically arranged within the casing and spaced from its peripheral wall, the space within which communicates with the downstream side of the defibering gap and with the reject chamber, and an accept stock chamber between the second screen plate and the wall of the casing, characterised in that the rotor defines a dilution water chamber which communicates with the space within the first screen plate, at least at the portion closest to the reject outlet, through a plurality of openings formed in the peripheral wall of the dilution chamber and spaced apart in the peripheral direction and with the space within the second screen plate through a plurality of openings formed in the peripheral wall of the dilution chamber and spaced apart in the peripheral direction and the dilution water supply means terminates in or adjacent the dilution chamber for supplying dilution water to the dilution chamber.

The invention also embraces a method of screening waste paper pulp stock containing undefibred waste paper and according to a further aspect of the invention there is provided such a method comprising supplying the stock to a screen plate, thereby separating the stock into accept stock, which passes through the screen plate and is then discharged through one or more accept stock outlets, and reject, which does not pass through the screen plate, passing the reject through a defibering gap defined between a defibering stator and a rotating defibering rotor, thereby defibering at least some of the undefibered waste paper, subsequently diluting at least some of the reject with dilution water and subjecting the diluted reject to a further screening process, thereby separating it into accept stock and reject, and subsequently discharging at least some of the reject through a reject outlet, characterised by circulating the diluted reject back through a dilution chamber to the space within the screen plate upstream of the defibering gap, at least at the portion closest to the reject outlet. The pressure of the reject is preferably increased as it passes through the defibering gap.

According to yet a further aspect of the present invention there is provided a method of screening waste paper pulp stock containing undefibered waste paper comprising supplying the stock to a first screen plate, thereby separating the stock into accept stock, which passes through the first screen plate and is then discharged through one or more accept stock outlets, and reject, which does not pass through the first screen plate, passing the reject through a defibering gap defined between a defibering stator and a rotating defibering rotor, thereby defibering at least some of the undefibered waste paper, subsequently diluting at least some of the reject with dilution water and supplying the diluted reject to a further screen plate, thereby separating it into accept stock, which passes through the further screen plate and is then discharged through one or more accept stock outlets, and reject, which does not pass through the further screen plate, and subsequently discharging at least some of the reject through a reject outlet, characterised by supplying dilution water to a dilution chamber from which it flows both to the space within the first screen plate upstream of the defibering gap, at least at the portion closest to the reject outlet and to the space within the further screen plate and downstream of the defibering gap.

Certain preferred embodiments of the present invention will be described by way of example with reference to Figures 3 to 10 of the accompanying drawings, in which:-

Figure 3 is a front sectional view in section of a first embodiment of apparatus for screening waste paper pulp in accordance with the present invention;

Figure 4 is a view in the direction of the arrows IV-IV in Figure 3;

Figure 5X is a plan view of the defibering section of the first embodiment;

Figure 5Y is a sectional view of the defibering section shown in Figure 5X;

Figure 6X is a plan view of a modified defibering section;

Figure 6Y is a sectional view of the defibering section shown in Figure 6X;

Figure 7 is a front sectional view of a second embodiment of apparatus for screening waste paper pulp in accordance with the present invention;

Figure 8X is a plan view of the defibering section of the second embodiment;

Figure 8Y is a sectional view of the defibering section shown in Figure 8X;

Figure 9 is a flow diagram of the screening process based on the present invention; and

Figure 10 is a flow diagram of a screening process in which the present invention is applied to processing the reject.

The arrows in Figure 3 indicates the flows of the stock and dilution water. Reference numeral 1 represents a generally cylindrical casing with a stock inlet 3 at its lower end, a reject outlet 7 at its upper end and accept stock outlets 4 and 5 between the ends of the casing 1.

The casing 1 has primary and secondary cylindrical screen plates 18 and 19 concentrically fixed in the casing 1 to define primary and secondary accept stock chambers 14 and 15 between the inner surface of the casing 1 and the plates 18 and 19. The casing 1 further has an annular defibering stator 23 concentrically disposed in the casing 1 adjacent to and above the secondary screen plate 19 and a rotor 2 which is rotated by a drive unit (not shown) around the axis of the casing 1.

The casing 1 has at its lower inner end an inlet chamber 13 which communicates with the stock inlet 3 and with the space inside the screen plates 18 and 19. The primary and secondary accept stock chambers 14 and 15, which are defined outside the screen plates 18 and 19 and between them and the inner surface of the casing 1 are defined in the axial direction by annular partitions 28 and 29, and 28 and 30, respectively. The casing 1 further has at its upper inner end a reject chamber 17 which communicates with the reject outlet 7.

The rotor 2 has at its outer periphery scraper blades 21 opposed to the screen plates 18 and 19. The scraper blades 21 are of substantially circular arc section, as shown in Figure 4, the number of the blades 21 being usually two to eight, depending upon the size of the screen. A gap is defined between the scraper blades 21 and the screen plates 18 and 19 of 0.5 to 15 mm width. When the blades are rotated at a high speed of 10 to 25 m/s inside the screen plates 18 and 19, the mat of pulp accumulated on the inner surfaces of the screen plates 18 and 19 is destroyed by the negative pressure generated on a rear side of the blades in the direction of rotation, thereby preventing plugging of the screen plates 18 and 19. The scraper blades 21 and the screen plates 18 and 19 constitute primary and secondary screening sections 9 and 10.

The rotor 2 has at its upper end a defibering rotor 24 disposed adjacent to the scraper blades 21. The rotor 24 and the stator 23, which is fixed to the casing 1, constitute a defibering section 11 which may be designed as shown in Figures 5X and 5Y or as disclosed in JP-B-57-60475. As shown in Figures 5X and 5Y, the frustoconical operating surfaces of the stator 23 and rotor 24 diverge towards the reject chamber 17 and are opposed to each other with a slight gap and have a number of pockets formed circumferentially and in two steps in the direction of the generating line, that is to say each of the opposed surfaces have two circular arrays of pockets which are spaced apart in the axial direction, each array extending around the associated surface in the circumferential direction. The two arrays of pockets, i.e. that on the smaller and the larger diameter, serve as the inlet and outlet, respectively. When waste paper stock pulp slurry passes the operating surfaces and the pockets in them, undefibered waste paper is defibered by the fluid shearing action caused by the agitation or turbulence while contaminants, such as plastics, pass through without being pulverized. Further, the defibering section 11, whose outlet is of larger diameter than its inlet, serves to increase the pressure.

The rotor 2 defines at its upper end a cylindrical dilution chamber 27 which is open upwardly and communicates with the reject chamber 17. The dilution chamber 27 has a peripheral wall 33 through which dilution openings 25 extend and are directed towards the lower portion of the secondary screen plate 19. The number of the dilution openings 25 is usually two to eight, depending upon the size of the screen.

The casing 1 has at its top a dilution water nozzle 8 whose lower end is open adjacent to the dilution chamber 27 of the rotor 2.

In a modified construction, the shape of the defibering section 11 is as shown in Figures 6X and 6Y in which the inner periphery of the stator 23' and the outer periphery of the rotor 24', which is spaced by a small gap from the stator 23', each have steps of increased diameters in the direction of flow of the stock, the steps having a tooth shape similar to that on a spur gear. The partition 28 may be omitted to provide a single accept chamber; in this case, a single accept stock outlet is provided.

The mode of operation of the first embodiment of the invention is as follows:-

The waste paper stock pulp slurry containing undefibered waste paper is introduced through the stock inlet 3 into the inlet chamber 13 and flows to the primary screening section 9 within the primary screen plate 18 so that high quality stock passes through the plate 18 into the primary accept stock chamber 14 and then passes to the next stage through the primary accept stock outlet 4. The waste paper pulp slurry which does not pass through the plate 18 advanced to the secondary screening section 10, is diluted with dilution water supplied through the dilution openings 25 of the rotor

2 and undergoes screening. High quality stock passes through the secondary screen plate 19 into the secondary accept stock chamber 15 and passes to the next stage through the secondary accept stock outlet 5.

The reject which does not pass through the screen plate 19 in the secondary screening section 10 includes accumulated contaminants, such as plastics to be removed and undefibered waste paper, and passes to the defibering section 11 where the undefibered waste paper is defibered by the action of the turbulence and at the same time the pressure is increased by the pumping action of the defibering section 11. The contaminants, such as plastics, are not pulverized to a finer size but pass through the defibering section 11. After passing through the defibering section 11, the reject flows into the reject chamber 17 as waste paper stock pulp slurry containing newly defibered and withdrawable fibers. In the reject chamber 17, the slurry is mixed with dilution water coming through the dilution water nozzle 8. The diluted waste paper stock pulp slurry passes through the dilution chamber 27 of the rotor 2 and circulates through the dilution openings 25 into the secondary screening section 10 where the fibers newly defibered at the defibering section 11 are collected. The waste paper slurry in the reject chamber 17, which includes accumulated contaminants such as plastics, is partly discharged out of the system and is dumped.

The second embodiment of the present invention will now be described with reference to Figures 7 and 8.

The second embodiment is substantially similar to the first embodiment and the same components are referred by the same reference numerals and will not be described again. The primary and secondary screening sections 9 and 10 are referred to together as the front screening section 35 and the primary and secondary screen plates 18 and 19 are referred to together as the front screen plate 36.

The casing 1 additionally contains a rear screen plate 20 which is coaxial with the casing 1 and disposed adjacent to and above a defibering stator 23. A rear accept stock chamber 16 with a rear accept stock outlet 6 is defined between the rear screen plate 20 and the inner wall of the casing 1 and by radially extending annular partitions 31 and 32.

The rotor 2 has at its outer periphery rear scraper blades 22 adjacent to and above the defibering rotor 24. The rear screen plate 20 and the rear scraper blades 22 constitute a rear screening section 12.

The rotor 2 defines a dilution chamber 27 with a peripheral wall 33. Extending through the wall 33 are not only the dilution openings 25 directed toward the lower portion of the secondary screen plate 19 in the front screening section 35 but also dilution openings 26 directed towards the rear screen plate 20.

The dilution chamber 27 is closed at its top by a lid 34 through which the lower end of the dilution water nozzle 8 passes. This lid 34 may be omitted.

In this second embodiment, there is no need to increase the pressure in the defibering section 11. Therefore, the defibering section 11 need not have steps of upwardly increasing diameters, as shown in Figures 5X and 5Y or 6X and 6Y, and may be designed as shown in Figures 8X and 8Y in which a defibering stator 23" with inwardly directed comb-like teeth is engaged with a defibering rotor 24" with outwardly directed comb-like teeth such that their teeth are vertically aligned.

The mode of operation of the second embodiment is substantially similar to that of the first embodiment so only the operation of the additional components will be described.

The reject, which has passed through the defibering section 11, is in the form of waste paper stock pulp slurry and contains fibers which are newly defibered and can be withdrawn for utilization. The reject enters into the rear screening section 12 and is diluted with dilution water supplied through the dilution openings 26 of the rotor 6 and undergoes screening. High quality stock, which passes through the rear screen plate 20, flows into the rear accept stock chamber 16, is discharged through the rear accept stock outlet 6 and passes to the next stage.

The high quality stock defibered in the defibering section 11 is withdrawn at the rear screening section 12 so that there is no need to circulate the reject from the rear screening section 12 to the screening sections 35 and 12. For this reason, the lid 34 is provided to separate of the dilution water from the screened reject. The lid 34 may be omitted so that the screened reject can be further circulated to the screening sections 35 and 12.

The application of apparatus for screening waste paper pulp according to the present invention to a screening stage or stages will now be described.

Figure 9 is a flow diagram of a process in which apparatus 37, 37' in accordance with the invention are used in the coarse and fine screening stages A and B of a screening installation. The apparatus 37 uses a hole screen plate since it is for the coarse screening stage. The apparatus 37' uses a slot screen plate since it is for the fine screening stage. Reference numerals 40, 41, 43 and 44 represent tanks and numerals 42 and 45 represent conventional screens for processing the reject.

By comparison of Figure 9 with Figure 2, it is evident that the number of screening apparatuses and tanks is substantially decreased.

Figure 10 shows the case in which apparatus according to the present invention is used to process the reject in a system of conventional type. Reference numeral 50 represents a conventional screen.

Table 1 shows experimental data when the apparatus constructed in accordance with the first embodiment (Figure 3) was used for actual screening of waste paper stock pulp slurry.

Table 1

		Conventional Screen	Invention
Processed quantity (T/D)	Stock inlet	30	30
	Primary accept stock outlet	22.5	22.5
	Secondary accept stock outlet	-	6
	Reject outlet	7.5	1.5
Reject ratio (%)		25	5
Content of undefibered substances (%)	Stock inlet	11	11
	Primary accept stock outlet	2	2
	Secondary accept stock outlet	-	2
	Reject outlet	30	38
Content of undefibered substances (T/D)	Stock inlet	3.3	3.3
	Primary accept stock outlet	0.45	0.45
	Secondary accept stock outlet	-	0.1
	Reject outlet	2.25	0.57
Reduction ratio of undefibered substances (%)		18	66

In this experiment, waste paper stock from cardboard with a stock consistency of 1.8% was used to compare the performance characteristics of a conventional screen with those of the apparatus according to the present invention (the apparatus shown in Figure 3). The screen plates employed were slot screen plates of 0.25 mm in width.

In Table 1, the processed quantity (T/D) represents the dry weight of stock in tonnes/day; the reject ratio (%) represents the ratio of the total dry weight of reject to the total dry weight of stock at the inlet; content of undefibered substances (%) represents the dry weight of undefibered substances per unit dry weight of processed stock; content of undefibered substances (T/D) represents the total dry weight of undefibered substances in the processed stock; and reduction ratio of undefibered substances (%) represents the reduction ratio of the total dry weight of undefibered substances after passing through the screening apparatus. The quantity of the undefibered substances was somewhat decreased in the conventional screen, which means that a certain amount of defibering occurred in the screen.

As is evident from the above test results, the reject ratio of the screening apparatus in accordance with the invention is 1/5 of that of the conventional screen whereas the quantity of undefibered substances in the accept stock was about the same as that of the conventional screen.

Thus in the apparatus for screening waste paper pulp according to the present invention, the screened reject is defibered by the defibering section 11 and dilution water is supplied to the secondary screening section 10 to perform screening at adequate consistency. Further, the rejected stock may be circulated. As a result, it is possible to reduce the quantity of the rejected stock, which flows out through the reject outlet 7, even when the reject is more than 20% at the primary and secondary screening sections 9 and 10. This makes it possible to satisfy two contradictory requirements, i.e. to obtain a screening effect without plugging and to reduce the total reject quantity.

Claims

1. Apparatus for screening waste paper pulp stock comprising a cylindrical casing (1) having a stock inlet (3) at one end, a reject outlet (7) at the other end and one or more accept stock outlets (4,5) between its ends, a cylindrical screen plate (18,19) concentrically arranged within the casing (1) and spaced from its peripheral wall, an annular defibering stator (23) concentrically arranged adjacent the end of the screen plate (18,19) closest to the reject outlet (7), a rotor (2) arranged within the casing (1) for rotation about its axis within the screen plate, the casing (1) defining an inlet chamber (13), which communicates with the stock inlet (3) and with the space inside the screen plate (18,19), an accept stock chamber (14,15) between the screen plate (18,19) and the wall of the casing (1), which communicates with the accept stock outlet(s) (4,5), and a reject chamber (17), which communicates with the reject outlet (7), the rotor (2) carrying scraper blades (21) opposed to the screen plate (18,19) to prevent clogging thereof and a defibering rotor (24) opposed to the defibering stator (23) and defining therewith a defibering

gap which communicates with the reject chamber (17) and with the space within the screen plate (18,19) and means for supplying dilution water (8) to the space downstream of the defibering gap, characterised in that the rotor (2) defines a dilution water chamber (27) which communicates with the reject chamber (17) and with the space within the screen plate (18,19), at least at the portion (10) closest to the reject outlet (7), through a plurality of openings (25) formed in the peripheral wall (33) of the dilution chamber and spaced apart in the peripheral direction and the dilution water supply means (8) terminates in or adjacent the dilution chamber (27) for supplying dilution water to the dilution chamber (27).

2. Apparatus as claimed in Claim 1 in which the screen plate is constituted by two substantially coaxial screen plates (18,19) which partially define respective portions (14,15) of the accept stock chamber which are separated from one another by a partition (28) and communicate with respective accept stock outlets (4,5).

3. Apparatus as claimed in Claim 1 or Claim 2 in which the gap defined by the defibering stator (23) and the defibering rotor (24) communicates directly with the reject chamber (7), the surfaces defining the said gap are divergent in the direction towards the reject chamber (7) and the dilution water supply means (8) is arranged to supply dilution water into the reject chamber (17) at a position adjacent to the dilution chamber (27).

4. Apparatus for screening waste paper pulp stock comprising a cylindrical casing (1) having a stock inlet (3) at one end, a reject outlet (7) at the other end and one or more accept stock outlets (4,5,6) between its ends, a first cylindrical screen plate (18,19) concentrically arranged within the casing (1) and spaced from its peripheral wall, an annular defibering stator (23) concentrically arranged adjacent the end of the first screen plate (18,19) closest to the reject outlet (7), a rotor (2) arranged within the casing (1) for rotation about its axis within the first screen plate, the casing (1) defining an inlet chamber (13), which communicates with the stock inlet (3) and with the space inside the first screen plate (18,19), an accept stock chamber (14,15) between the first screen plate (18,19) and the wall of the casing (1), which communicates with the accept stock outlet(s) (4,5), and a reject chamber (17), which communicates with the reject outlet (7), the rotor (2) carrying scraper blades (21) opposed to the first screen plate (18,19) to prevent clogging thereof and a defibering rotor (24) opposed to the defibering stator (23) and defining therewith a defibering gap which communicates on its upstream side with the space within the first screen plate (18,19), means for supplying dilution water (26) to the space downstream of the defibering gap, a second cylindrical screen plate (20) concentrically arranged within the casing (1) and spaced from its peripheral wall, the space within which communicates with the downstream side of the defibering gap and with the reject chamber (17), and an accept stock chamber (16) between the second screen plate (20) and the wall of the casing (2), characterised in that the rotor (2) defines a dilution water chamber (27) which communicates with the space within the first screen plate (18,19), at least at the portion (10) closest to the reject outlet (7), through a plurality of openings (25) formed in the peripheral wall (33) of the dilution chamber and spaced apart in the peripheral direction and with the space within the second screen plate (20) through a plurality of openings (26) formed in the peripheral wall (33) of the dilution chamber and spaced apart in the peripheral direction and the dilution water supply means (8) terminates in or adjacent the dilution chamber (27) for supplying dilution water to the dilution chamber (27).

5. Apparatus as claimed in Claim 4 in which the first screen plate is constituted by two substantially coaxial screen plates (18,19) which partially define respective portions (14,15) of the accept stock chamber which are separated from one another by a partition (28) and communicate with respective accept stock outlets (4,5).

6. Apparatus as claimed in Claim 4 or 5 in which the dilution water supply means (8) is arranged to supply dilution water directly into the dilution chamber (27) which does not communicate directly with the reject chamber (17).

7. A method of screening waste paper pulp stock containing undefibered waste paper comprising supplying the stock to a screen plate (18,19), thereby separating the stock into accept stock, which passes through the screen plate (18,19) and is then discharged through one or more accept stock outlets (4,5), and reject, which does not pass through the screen plate (18,19), passing the reject through a defibering gap defined between a defibering stator (23) and a rotating defibering rotor (24), thereby defibering at least some of the undefibered waste paper, subsequently diluting at least some of the reject with dilution water and subjecting the diluted reject to a further screening process, thereby separating it into accept stock and reject, and subsequently discharging at least some of the reject through a reject outlet (7), characterised by circulating the diluted reject back through a dilution chamber (27) to the space within the screen plate (18, 19) upstream of the defibering gap, at least at the portion (10) closest to the reject outlet (7).

8. A method as claimed in Claim 7 in which the pressure of the reject is increased as it passes through the defibering

gap.

9. A method of screening waste paper pulp stock containing undefibered waste paper comprising supplying the stock to a first screen plate (18,19), thereby separating the stock into accept stock, which passes through the first screen plate (18,19) and is then discharged through one or more accept stock outlets (4,5), and reject, which does not pass through the first screen plate (18,19), passing the reject through a defibering gap defined between a defibering stator (23) and a rotating defibering rotor (24), thereby defibering at least some of the undefibered waste paper, subsequently diluting at least some of the reject with dilution water and supplying the diluted reject to a further screen plate (20), thereby separating it into accept stock, which passes through the further screen plate (20) and is then discharged through one or more accept stock outlets (6), and reject, which does not pass through the further screen plate (20), and subsequently discharging at least some of the reject through a reject outlet (7), characterised by supplying dilution water to a dilution chamber (27) from which it flows both to the space within the first screen plate (18, 19) upstream of the defibering gap, at least at the portion (10) closest to the reject outlet (7) and to the space within the further screen plate (20) and downstream of the defibering gap.

Patentansprüche

1. Vorrichtung zum Sieben von Altpapiermasse, mit einem zylindrischen Gehäuse (1), das einen Papiermasseeinlaß (3) an einem Ende, einen Ausschußauslaß (7) am anderen Ende und einen oder mehrere Nutzpapiermasseauslässe (4, 5) zwischen seinen Enden besitzt; einer zylindrischen Siebplatte (18, 19), die innerhalb des Gehäuses (1) konzentrisch angeordnet ist und von ihrer Umfangswand beabstandet ist; einem ringförmigen Zerfaserungsstator (23), der nahe dem Ende der Siebplatte (18, 19) dicht am Ausschußauslaß (7) konzentrisch angeordnet ist; einem Rotor (2), der innerhalb des Gehäuses (1) angeordnet ist und sich innerhalb der Siebplatte um seine Achse dreht, wobei das Gehäuse eine Einlaßkammer (13) definiert, die mit dem Papiermasseeinlaß (3) und dem Raum innerhalb der Siebplatte (18, 19), einer Nutzpapiermassekammer (14, 15) zwischen der Siebplatte (18, 19) und der Wand des Gehäuses (1), die mit den Nutzpapiermasseauslässen (4, 5) verbunden ist, und einer Ausschußkammer (17), die mit dem Ausschußauslaß 7 verbunden ist, in Verbindung steht, wobei der Rotor (2) Schaberklingen (21) trägt, die der Siebplatte (18, 19) gegenüberliegen, um ein Zusetzen derselben zu verhindern, und ein Zerfaserungsrotor (24) dem Zerfaserungsstator (23) gegenüberliegt und mit diesem einen Zerfaserungszwischenraum definiert, der mit der Ausschußkammer (17) und mit dem Raum innerhalb der Siebplatte (18, 19) in Verbindung steht; und einer Einrichtung zum Zuführen von Verdünnungswasser (8) in den Raum stromabseitig des Zerfaserungszwischenraums, dadurch gekennzeichnet, daß der Rotor (2) eine Verdünnungswasserkammer (27) definiert, die mit der Ausschußkammer (17) und mit dem Raum innerhalb der Siebplatte (18, 19), wenigstens am Abschnitt (10) dicht beim Ausschußauslaß (7), über mehrere Öffnungen (25), die in der Umfangswand (33) der Verdünnungskammer ausgebildet sind und in Umfangsrichtung beabstandet sind, verbunden ist, und daß die Verdünnungswasserzuführungseinrichtung (8) in der Verdünnungskammer (27) oder in der Nähe derselben endet, um der Verdünnungskammer (27) Verdünnungswasser zuzuführen.

2. Vorrichtung nach Anspruch 1, in der die Siebplatte von zwei im wesentlichen koaxialen Siebplatten (18, 19) gebildet wird, die teilweise entsprechende Abschnitte (14, 15) der Nutzpapiermassekammer bilden, die durch eine Trennwand (28) voneinander getrennt sind und mit entsprechenden Nutzpapiermasseauslässen (4, 5) in Verbindung stehen.

3. Vorrichtung nach Anspruch 1 oder Anspruch 2, in der der vom Zerfaserungsstator (23) und Zerfaserungsrotor (24) definierte Zwischenraum direkt mit der Ausschußkammer (7) in Verbindung steht, wobei die Oberflächen, die den Zwischenraum definieren, in Richtung zur Ausschußkammer (7) divergieren und die Verdünnungswasserzuführungseinrichtung (8) so beschaffen ist, daß sie das Verdünnungswasser an einer Position nahe der Verdünnungskammer (27) in die Ausschußkammer (17) einleitet.

4. Vorrichtung zum Sieben von Altpapiermasse, mit einem zylindrischen Gehäuse (1), das einen Papiermasseeinlaß (3) an einem Ende, einen Ausschußauslaß (7) am anderen Ende und einen oder mehrere Nutzpapiermasseauslässe (4, 5, 6) zwischen seinen Enden besitzt; einer ersten zylindrischen Siebplatte (18, 19), die innerhalb des Gehäuses (1) konzentrisch angeordnet ist und von ihrer Umfangswand beabstandet ist; einem ringförmigen Zerfaserungsstator (23), der nahe dem Ende der ersten Siebplatte (18, 19) dicht am Ausschußauslaß (7) konzentrisch angeordnet ist; einem Rotor (2), der innerhalb des Gehäuses (1) angeordnet ist und sich innerhalb der ersten Siebplatte um seine Achse dreht, wobei das Gehäuse eine Einlaßkammer (13) definiert, die mit dem Papiermasseeinlaß (3) und dem Raum innerhalb der ersten Siebplatte (18, 19), einer Nutzpapiermassekammer (14, 15)

zwischen der ersten Siebplatte (18, 19) und der Wand des Gehäuses (1), die mit den Nutzpapiermasseauslässen (4, 5) verbunden ist, und einer Ausschußkammer (17), die mit dem Ausschußauslaß 7 verbunden ist, in Verbindung steht, wobei der Rotor (2) Schaberklingen (21) trägt, die der ersten Siebplatte (18, 19) gegenüberliegen, um ein Zusetzen derselben zu verhindern, und ein Zerfaserungsrotor (24) dem Zerfaserungsstator (23) gegenüberliegt und mit diesem einen Zerfaserungszwischenraum definiert, der mit der Ausschußkammer (17) und mit dem Raum innerhalb der ersten Siebplatte (18, 19) in Verbindung steht; einer Einrichtung zum Zuführen von Verdünnungswasser (8) in den Raum stromabseitig des Zerfaserungszwischenraums; einer zweiten zylindrische Siebplatte (20), die innerhalb des Gehäuses (1) konzentrisch angeordnet ist und von deren Umfangswand beabstandet ist, wobei der Raum innerhalb derselben mit der Auslaßseite des Zerfaserungszwischenraums und mit der Ausschußkammer (17) sowie einer Nutzpapiermassekammer (16) zwischen der zweiten Siebplatte (20) und der Wand des Gehäuses (2) in Verbindung steht, dadurch gekennzeichnet, daß der Rotor (2) eine Verdünnungswasserkammer (27) definiert, die mit dem Raum innerhalb der ersten Siebplatte (18, 19), wenigstens am Abschnitt (10) dicht beim Ausschußauslaß (7), über mehrere Öffnungen (25), die in der Umfangswand (33) der Verdünnungskammer ausgebildet sind und in Umfangsrichtung beabstandet sind, verbunden ist und mit dem Raum innerhalb der zweiten Siebplatte (20) über mehrere Öffnungen (26) in Verbindung steht, die in der Umfangswand (33) der Verdünnungskammer ausgebildet sind und in Umfangsrichtung beabstandet sind, und daß die Verdünnungswasserzuführungseinrichtung (8) in der Verdünnungskammer (27) oder in der Nähe derselben endet, um der Verdünnungskammer (27) Verdünnungswasser zuzuführen.

5. Vorrichtung nach Anspruch 4, in der die erste Siebplatte von zwei im wesentlichen koaxialen Siebplatten (18, 19) gebildet wird, die teilweise entsprechende Abschnitte (14, 15) der Nutzpapiermassekammer bilden, die durch eine Trennwand (28) voneinander getrennt sind und mit entsprechenden Nutzpapiermasseauslässen (4, 5) in Verbindung stehen.

6. Vorrichtung nach Anspruch 4 oder 5, in der die Verdünnungswasserzuführungseinrichtung (8) so beschaffen ist, daß sie Verdünnungswasser direkt in die Verdünnungskammer (27) zuführt, die nicht direkt mit der Ausschußkammer (17) verbunden ist.

7. Verfahren zum Sieben von Altpapiermasse, die unzerfasertes Altpapier enthält, wobei das Verfahren umfaßt: Zuführen der Papiermasse zu einer Siebplatte (18, 19), um die Papiermasse in eine Nutzpapiermasse, die durch die Siebplatte (18, 19) dringt und anschließend durch einen oder mehrere Nutzpapiermasseauslässe (4, 5) abgegeben wird, und in Ausschuß, der nicht durch die Siebplatte (18, 19) dringt; Durchleiten des Ausschusses durch einen Zerfaserungszwischenraum, der zwischen einem Zerfaserungsstator (23) und einem rotierenden Zerfaserungsrotor (24) definiert ist, um somit wenigstens einen Teil des unzerfaserten Altpapiers zu zerfasern; anschließendes Verdünnen wenigstens eines Teils des Ausschusses mit Verdünnungswasser und Unterwerfen des verdünnten Ausschusses einem weiteren Siebprozeß, um diesen in Nutzpapiermasse und Ausschuß zu trennen; und anschließendes Ausgeben wenigstens eines Teils des Ausschusses durch einen Ausschußauslaß (7), gekennzeichnet durch die Rückführung des verdünnten Ausschusses über eine Verdünnungskammer (27) zum Raum innerhalb der Siebplatte (18, 19) stromaufseitig des Zerfaserungszwischenraums wenigstens am Abschnitt (10) dicht am Ausschußauslaß (7).

8. Verfahren nach Anspruch 7, in dem der Druck des Ausschusses erhöht ist, wenn dieser durch den Zerfaserungszwischenraum geleitet wird.

9. Verfahren zum Sieben von Altpapiermasse, die unzerfasertes Altpapier enthält, wobei das Verfahren umfaßt: Zuführen der Papiermasse zu einer ersten Siebplatte (18, 19), um die Papiermasse in eine Nutzpapiermasse, die durch die erste Siebplatte (18, 19) dringt und anschließend durch einen oder mehrere Nutzpapiermasseauslässe (4, 5) abgegeben wird, und in Ausschuß, der nicht durch die erste Siebplatte (18, 19) dringt; Durchleiten des Ausschusses durch einen Zerfaserungszwischenraum, der zwischen einem Zerfaserungsstator (23) und einem rotierenden Zerfaserungsrotor (24) definiert ist, um somit wenigstens einen Teil des unzerfaserten Altpapiers zu zerfasern; anschließendes Verdünnen wenigstens eines Teils des Ausschusses mit Verdünnungswasser und Zuführen des verdünnten Ausschusses zu einer weiteren Siebplatte (20), um diesen in Nutzpapiermasse, die durch die weitere Siebplatte (20) dringt und anschließend durch einen oder mehrere Nutzpapiermasseauslässe (6) ausgegeben wird, und in Ausschuß, der nicht durch die weitere Siebplatte (20) dringt, zu trennen; sowie anschließendes Ausgeben wenigstens eines Teils des Ausschusses durch einen Ausschußauslaß (7), gekennzeichnet durch das Zuführen von Verdünnungswasser in einen Verdünnungskammerraum (27), aus dem dieses sowohl zum Raum innerhalb der ersten Siebplatte (18, 19) stromaufseitig des Zerfaserungszwischenraumes, wenigstens am Abschnitt (10) dicht am Ausschußauslaß (7), als auch zum Raum innerhalb der weiteren Siebplatte (20) stromab-

seitig des Zerfaserungszwischenraumes fließt.

Revendications

1. Appareil destiné à épurer de la pâte de vieux papiers, comprenant une cuve cylindrique (1) comportant un orifice d'entrée de pâte (3) à une première extrémité, un orifice de sortie de rejets (7) à l'autre extrémité, ainsi qu'un ou plusieurs orifices de sortie de pâte acceptée (4, 5) entre ses extrémités, une plaque perforée cylindrique (18, 19) disposée de façon concentrique à l'intérieur de la cuve (1) et espacée de sa paroi périphérique, un stator de défibrage annulaire (23) disposé de façon concentrique à proximité de l'extrémité de la plaque perforée (18, 19) la plus proche de l'orifice de sortie de rejets (7), un rotor (2) disposé à l'intérieur de la cuve (1) afin de tourner autour de son axe à l'intérieur de la plaque perforée, la cuve (1) définissant une chambre d'entrée (13) qui communique avec l'orifice d'entrée de pâte (3) et avec l'espace à l'intérieur de la plaque perforée (18, 19), une chambre de pâte acceptée (14, 15) entre la plaque perforée (18, 19) et la paroi de la cuve (1), qui communique avec le ou les orifices de sortie de pâte acceptée (4, 5), ainsi qu'une chambre de rejets (17), qui communique avec l'orifice de sortie de rejets (7), le rotor (2) portant des pales détacheuses (21) opposées à la plaque perforée (18, 19) afin d'empêcher le colmatage de celle-ci, et un rotor de défibrage (24) opposé au stator de défibrage (23) et définissant avec celui-ci un interstice de défibrage qui communique avec la chambre de rejets (17) et avec l'espace à l'intérieur de la plaque perforée (18, 19), ainsi que des moyens destinés à délivrer de l'eau de dilution (8) dans l'espace en aval de l'interstice de défibrage, caractérisé en ce que le rotor (2) définit une chambre à eau de dilution (27) qui communique avec la chambre de rejets (17) et avec l'espace à l'intérieur de la plaque perforée (18, 19), au moins au niveau de la partie (10) la plus proche de l'orifice de sortie de rejets (7), par l'intermédiaire d'une pluralité d'ouvertures (25) formées dans la paroi périphérique (33) de la chambre de dilution et espacées suivant la périphérie, et en ce que le moyen d'alimentation en eau de dilution (8) se termine dans la chambre de dilution (27) ou à proximité de celle-ci afin de délivrer de l'eau de dilution dans la chambre de dilution (27).

2. Appareil selon la revendication 1, dans lequel la plaque perforée est constituée par deux plaques perforées pratiquement coaxiales (18, 19) qui définissent partiellement des parties respectives (14, 15) de la chambre à pâte acceptée qui sont séparées l'une de l'autre par une cloison (28) et communiquent avec les orifices de sortie de pâte acceptée respectifs (4, 5).

3. Appareil selon la revendication 1 ou la revendication 2, dans lequel l'interstice défini par le stator de défibrage (23) et le rotor de défibrage (24) communique directement avec la chambre à rejets (7), les surfaces qui définissent ledit interstice divergent en direction de la chambre à rejets (7), et le moyen d'alimentation en eau de dilution (8) est conçu de façon à délivrer de l'eau de dilution dans la chambre à rejets (17) en un emplacement adjacent à la chambre de dilution (27).

4. Appareil destiné à épurer de la pâte de vieux papiers comprenant une cuve cylindrique (1) comportant un orifice d'entrée de pâte (3) à une première extrémité, un orifice de sortie de rejets (7) à l'autre extrémité, ainsi qu'un ou plusieurs orifices de sortie de pâte acceptée (4, 5, 6) entre ses extrémités, une première plaque perforée cylindrique (18, 19) agencée de façon concentrique à l'intérieur de la cuve (1) et espacée de sa paroi périphérique, un stator de défibrage annulaire (23) disposé de façon concentrique à proximité de l'extrémité de la première plaque perforée (18, 19) la plus proche de l'orifice de sortie de rejets (7), un rotor (2) disposé à l'intérieur de la cuve (1) afin de tourner autour de son axe à l'intérieur de la première plaque perforée, la cuve (1) définissant une chambre d'entrée (13), qui communique avec l'orifice d'entrée de pâte (3) et avec l'espace à l'intérieur de la première plaque perforée (18, 19), une chambre à pâte acceptée (14, 15) entre la première plaque perforée (18, 19) et la paroi de la cuve (1), qui communique avec l'orifice ou les orifices de sortie de pâte acceptée (4, 5), et une chambre à rejets (17), qui communique avec l'orifice de sortie de rejets (7), le rotor (2) portant des pales détacheuses (21) opposées à la première plaque perforée (18, 19) afin d'empêcher le colmatage de celle-ci, et un rotor de défibrage (24) opposé au stator de défibrage (23) et définissant avec celui-ci un interstice de défibrage qui communique sur son côté amont avec l'espace à l'intérieur de la première plaque perforée (18, 19), un moyen destiné à introduire de l'eau de dilution (26) dans l'espace en aval de l'interstice de défibrage, une seconde plaque perforée cylindrique (20) disposée de façon concentrique à l'intérieur de la cuve (1) et espacée de sa paroi périphérique, dont l'espace intérieur communique avec le côté aval de l'interstice de défibrage et avec la chambre à rejets (17), et une chambre à pâte acceptée (16) entre la seconde plaque perforée (20) et la paroi de la cuve (2), caractérisé en ce que le rotor (2) définit une chambre à eau de dilution (27) qui communique avec l'espace à l'intérieur de la première plaque perforée (18, 19), au moins au niveau de la partie (10) la plus proche de l'orifice de sortie de rejets (7), par l'intermédiaire d'une pluralité d'ouvertures (25) formées dans la paroi périphérique (33) de la chambre de dilution

et espacées suivant la direction de la périphérie, ainsi qu'avec l'espace à l'intérieur de la seconde plaque perforée (20) par l'intermédiaire d'une pluralité d'ouvertures (26) formées dans la paroi périphérique (33) de la chambre de dilution et espacées suivant la direction de la périphérie, et le moyen d'alimentation en eau de dilution (8) se termine dans la chambre de dilution (27) ou à proximité de celle-ci afin d'introduire de l'eau de dilution dans la chambre de dilution (27).

5. Appareil selon la revendication 4, dans lequel la première plaque perforée est constituée par deux plaques perforées pratiquement coaxiales (18, 19) qui définissent partiellement des parties respectives (14, 15) de la chambre à pâte acceptée qui sont séparées l'une de l'autre par une cloison (28) et communiquent avec les orifices de sortie de pâte acceptée respectifs (4, 5).

6. Appareil selon la revendication 4 ou 5, dans lequel le moyen d'alimentation en eau de dilution (8) est agencé de façon à introduire de l'eau de dilution directement dans la chambre de dilution (27) qui ne communique pas directement avec la chambre à rejets (17).

7. Procédé d'épuration de pâte de vieux papiers contenant des vieux papiers non défibrés, comprenant les étapes consistant à délivrer la pâte à une plaque perforée (18, 19), en séparant ainsi la pâte en pâte acceptée, qui passe à travers la plaque perforée (18, 19) et est ensuite évacuée par l'intermédiaire d'un ou plusieurs orifices de sortie de pâte acceptée (4, 5), et en rejets, qui ne passent pas à travers la plaque perforée (18, 19), à faire passer les rejets au travers d'un interstice de défibrage défini entre un stator de défibrage (23) et un rotor de défibrage en rotation (24), en défibrant ainsi au moins une partie des vieux papiers non défibrés, à diluer ensuite au moins une partie des rejets avec de l'eau de dilution, et à soumettre les rejets dilués à un traitement d'épuration supplémentaire, en les séparant ainsi en pâte acceptée et en rejets, et à évacuer ensuite au moins une partie des rejets par l'intermédiaire d'un orifice de sortie de rejets (7), caractérisé par l'étape consistant à faire circuler les rejets dilués, par l'intermédiaire d'une chambre de dilution (27), en retour vers l'espace à l'intérieur de la plaque perforée (18, 19) en amont de l'interstice de défibrage, au moins au niveau de la partie (10) la plus proche de l'orifice de sortie de rejets (7).

8. Procédé selon la revendication 7, dans lequel la pression des rejets est augmentée lorsqu'ils passent au travers de l'interstice de défibrage.

9. Procédé d'épuration de pâte de vieux papiers contenant des vieux papiers non défibrés, comprenant les étapes consistant à délivrer la pâte à une première plaque perforée (18, 19), en séparant ainsi la pâte en pâte acceptée qui passe à travers la première plaque perforée (18, 19) et est ensuite évacuée par l'intermédiaire d'un ou plusieurs orifices de sortie de pâte acceptée (4, 5), et en rejets qui ne passent pas à travers la première plaque perforée (18, 19), à faire passer les rejets au travers d'un interstice de défibrage défini entre un stator de défibrage (23) et un rotor de défibrage en rotation (24), en défibrant ainsi au moins une partie des vieux papiers non défibrés, à diluer ensuite au moins une partie des rejets avec de l'eau de dilution, et à délivrer les rejets dilués à une autre plaque perforée (20), en les séparant ainsi en pâte acceptée, qui passe à travers l'autre plaque perforée (20) et est ensuite évacuée par l'intermédiaire d'un ou plusieurs orifices de sortie de pâte acceptée (6), et en rejets, qui ne passent pas à travers l'autre plaque perforée (20), et à évacuer ensuite au moins une partie des rejets par l'intermédiaire d'un orifice de sortie de rejets (7), caractérisé par l'étape consistant à délivrer de l'eau de dilution à un espace de chambre de dilution (27) à partir duquel elle circule à la fois vers l'espace à l'intérieur de la première plaque perforée (18, 19) en amont de l'interstice de défibrage, au moins au niveau de la partie (10) la plus proche de l'orifice de sortie de rejets (7), et vers l'espace à l'intérieur de l'autre plaque perforée (20) et en aval de l'interstice de défibrage.

FIG. 1

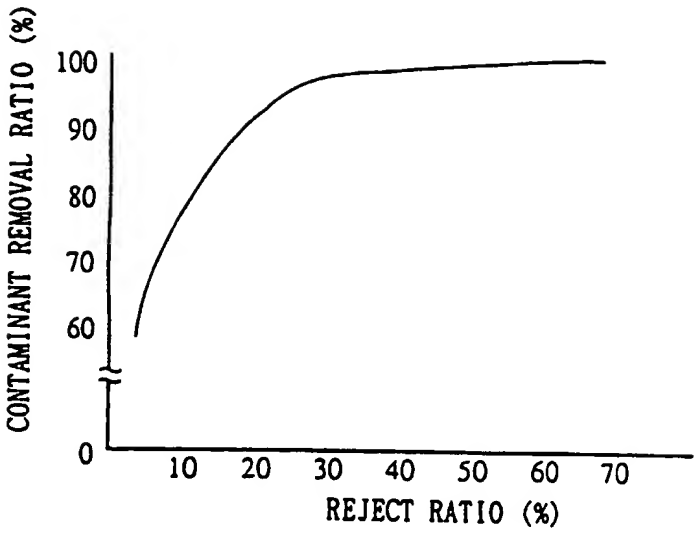
CONTAMINANT REMOVAL RATIO (%)
100
90
80
70
60
0
10
20
30
40
50
60
70
REJECT RATIO (%)

FIG. 2

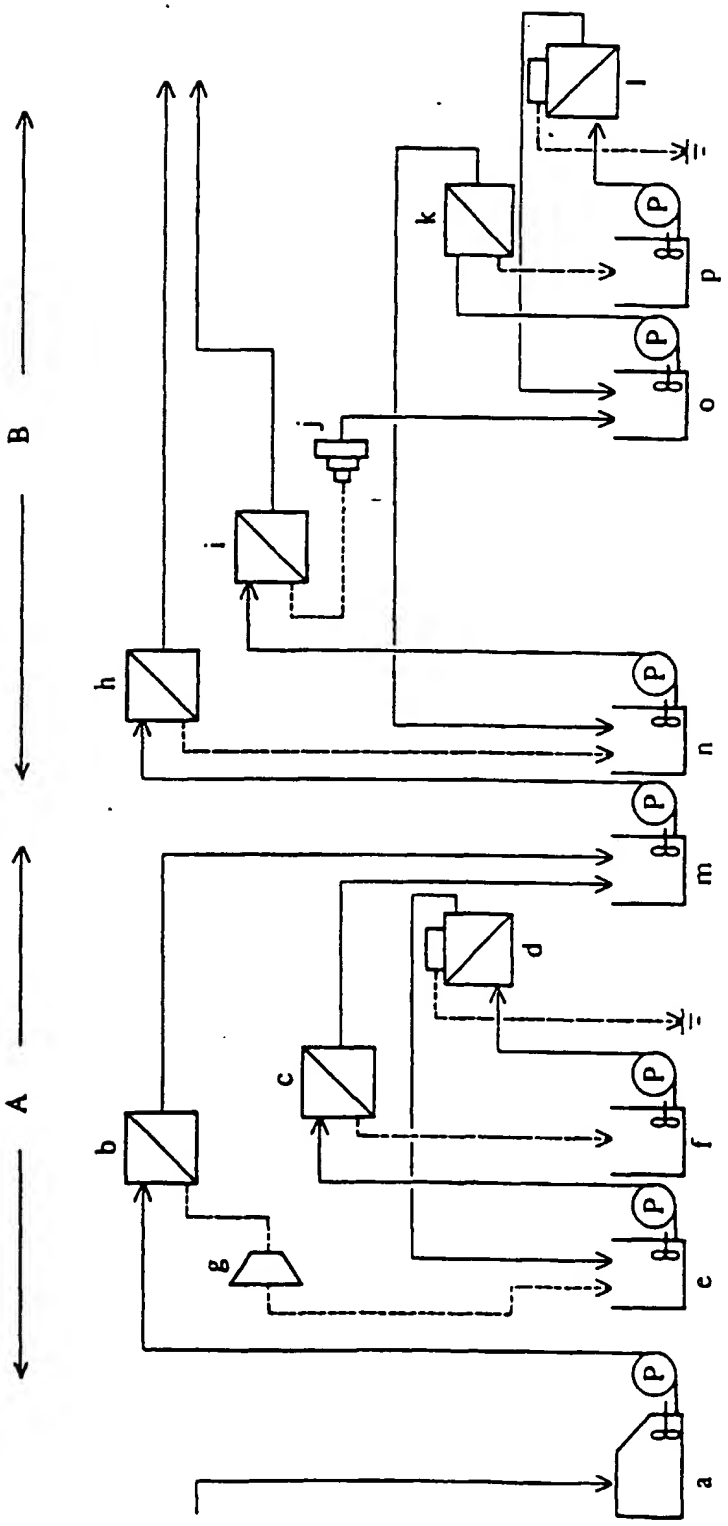

FIG. 3

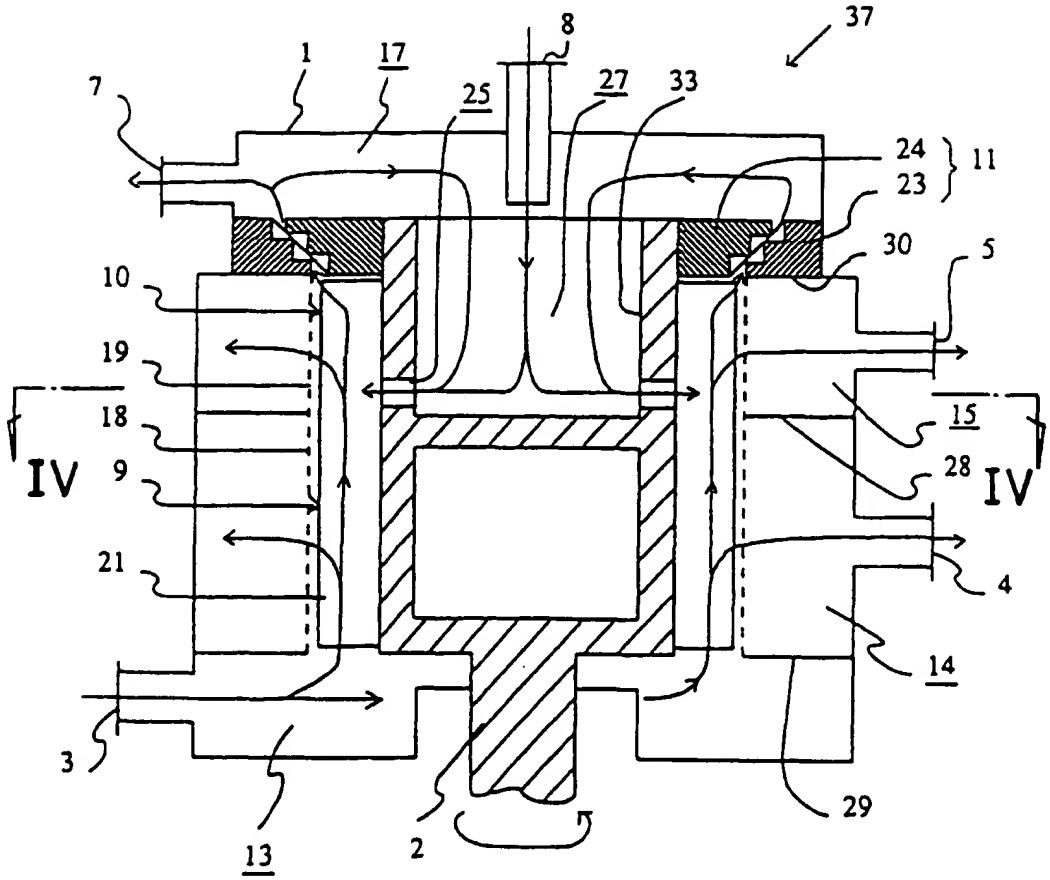

FIG. 4

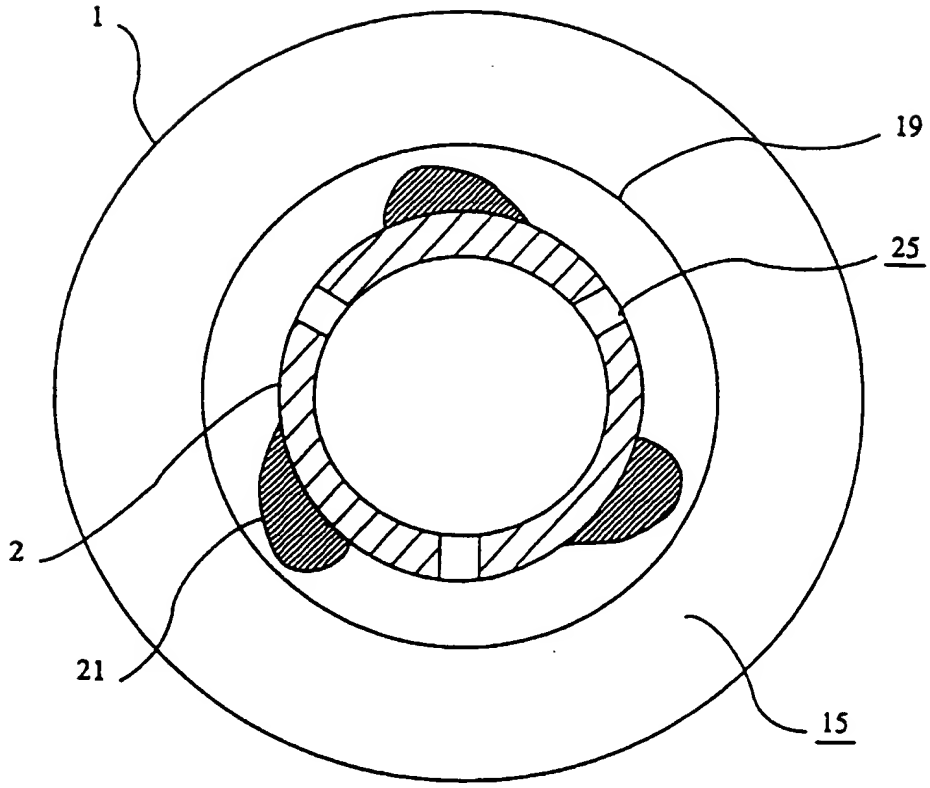

FIG. 5X

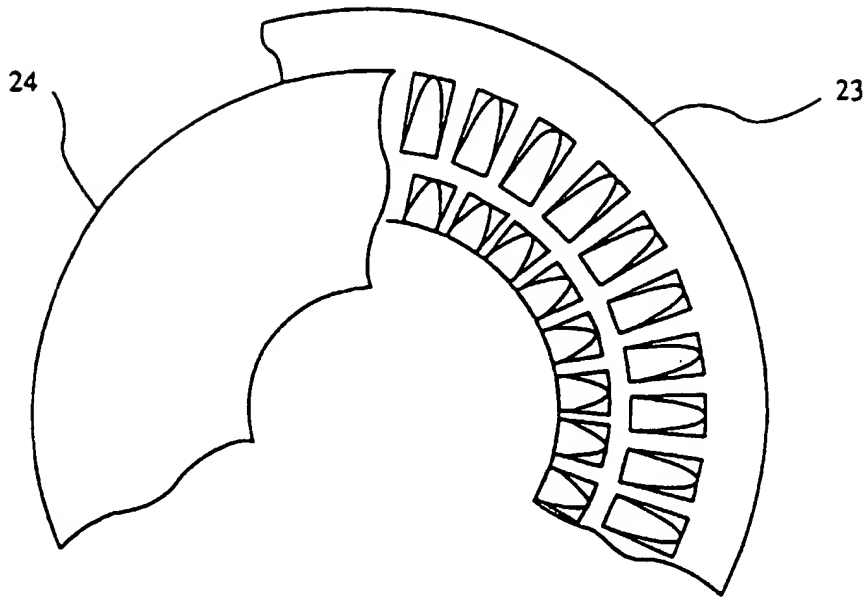

FIG. 5Y

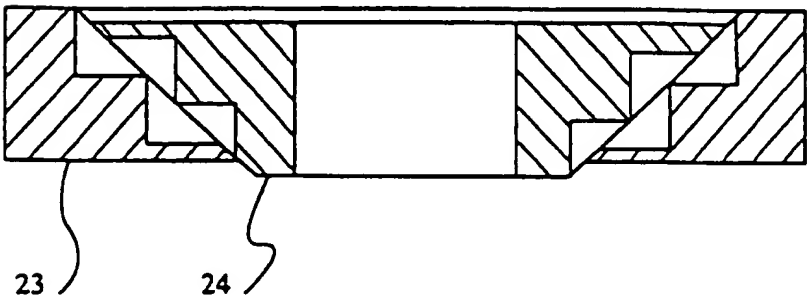

FIG. 6X

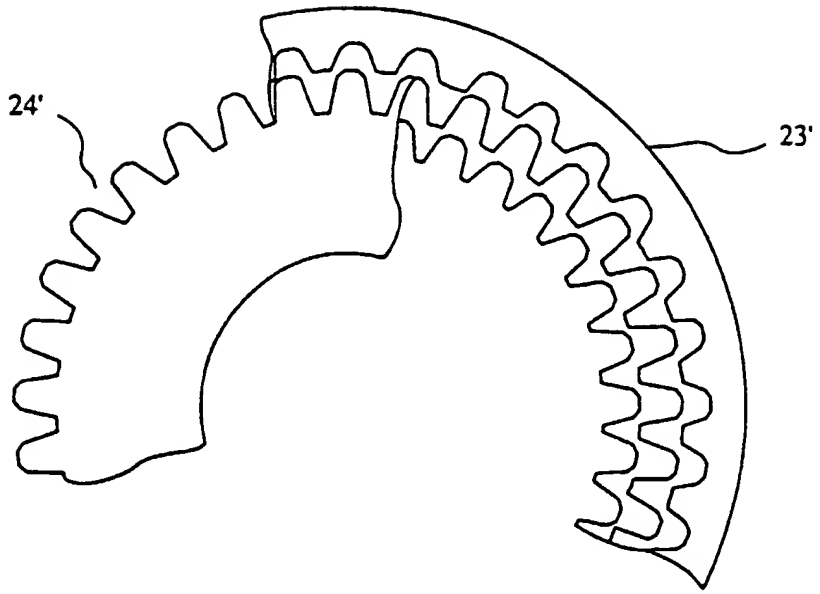

FIG. 6Y

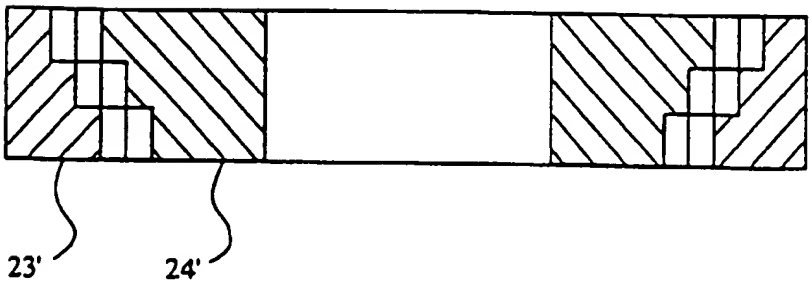

FIG. 7

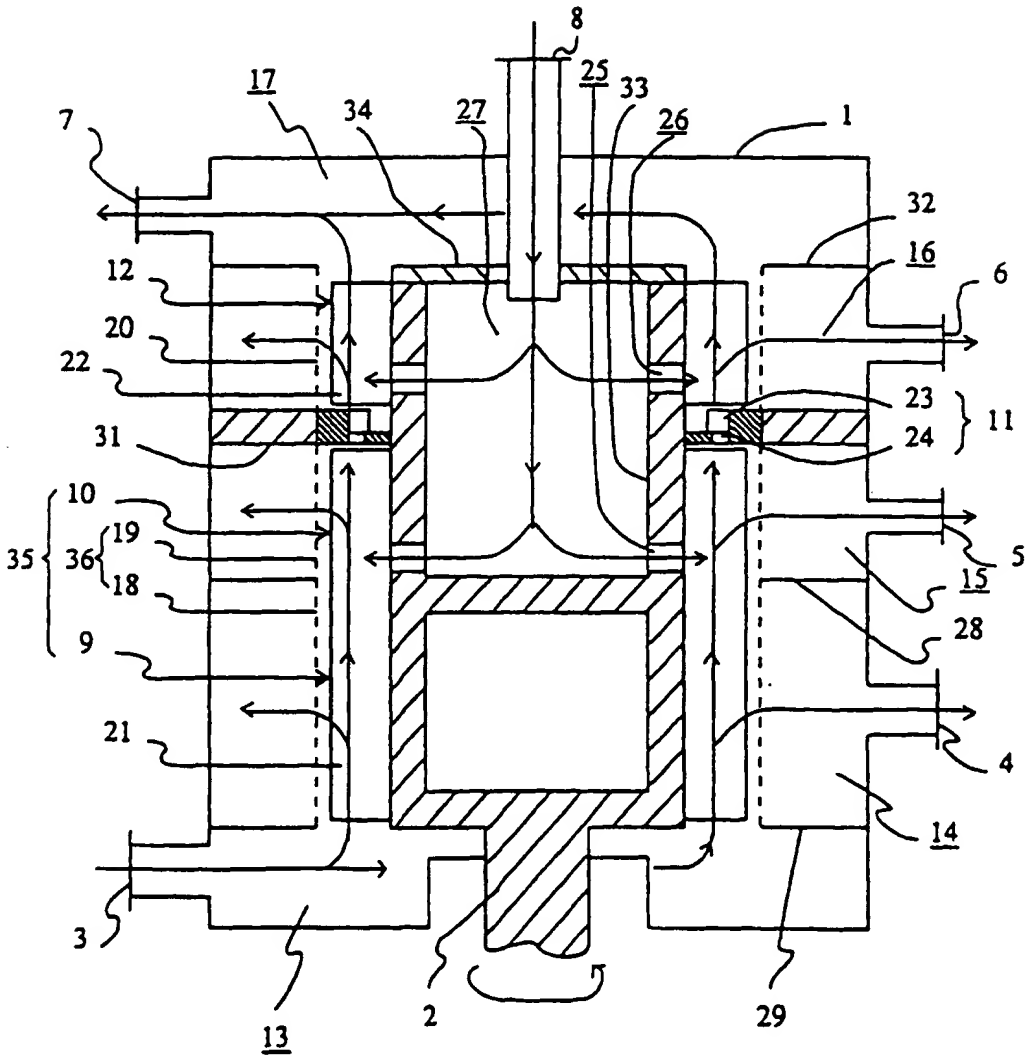
8
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FIG. 8X

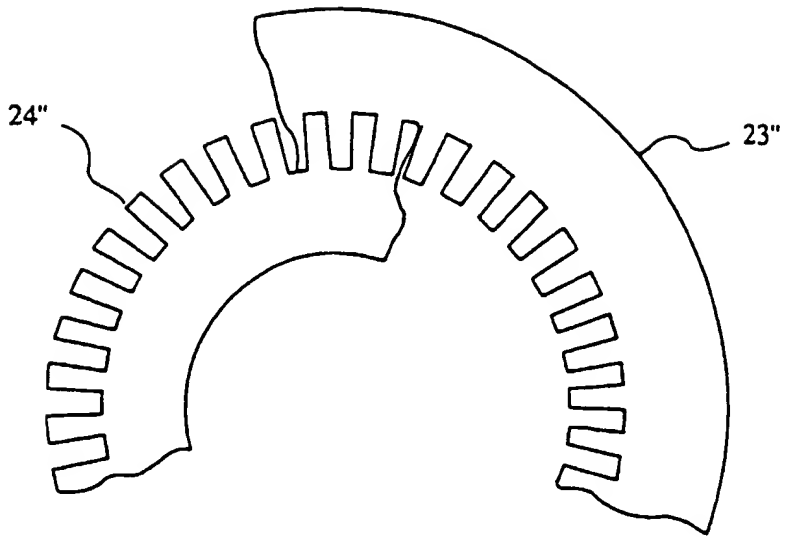

FIG. 8Y

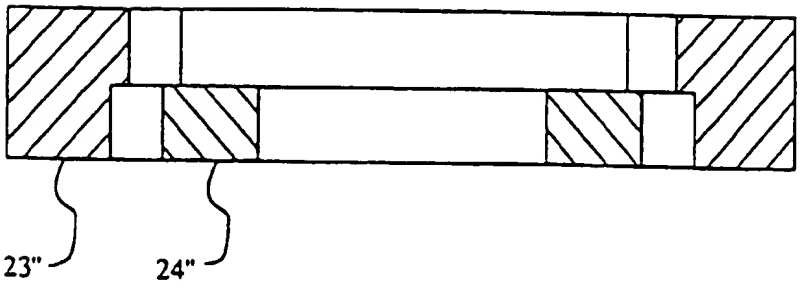

FIG. 9

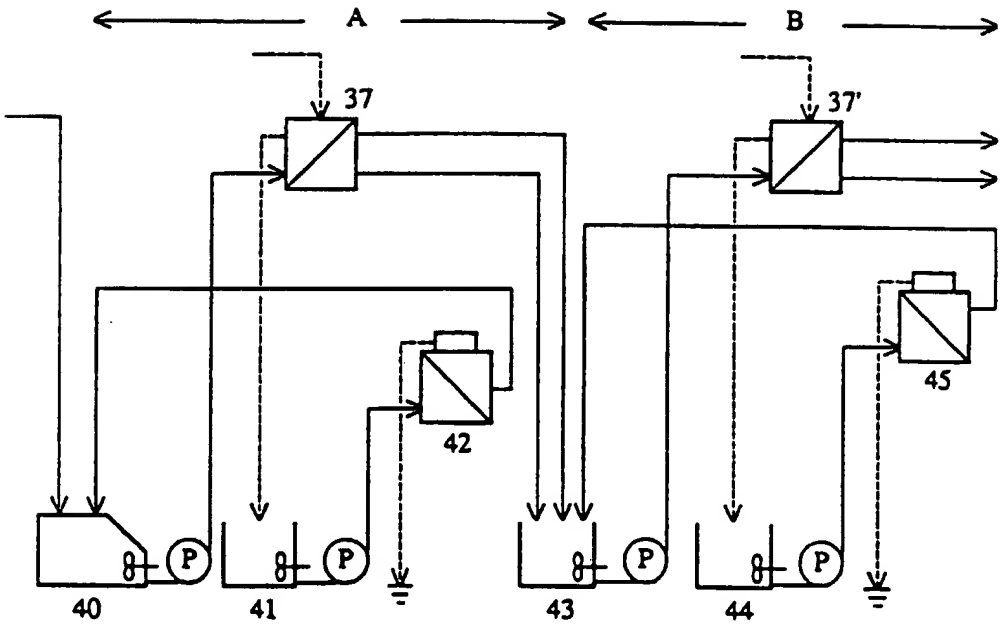

FIG. 10